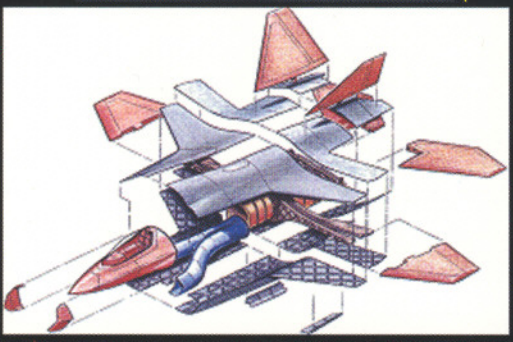
Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Aerospace Forces

STRUCTURES DIVISION



AIR VEHICLES DIRECTORATE

MISSION

Plans, directs, manages, and performs basic research, exploratory development, and advanced development in air vehicle structural design, structural technology integration, analytical structural mechanics, structural dynamics, sustainment, and extreme combined environment structures to solve critical structural problems on fixed-wing aerospace vehicles. Supports the Air Vehicles Directorate's focus areas of aircraft sustainment, uninhabited air vehicles, and future strike/space operating vehicles. Transitions technology results and products to major Air Force commands, other government organizations and industry through in-house and contracted efforts, consultation to System Program Offices, Air Logistics Centers, and other AFRL Directorates, and through participation in professional organizations. Provides technical advice and support to other DoD organizations and government agencies.

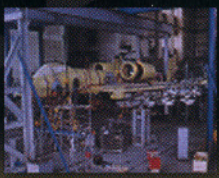
BRANCHES

Structural Design & Development Branch (VASD): conducts and manages R&D in structural design methods and concepts.

Analytical Structural Mechanics Branch (VASM): conducts and manages R&D in fatigue, fracture mechanics, and structural life assessment.

Structural Dynamics Branch (VASS): conducts R&D in vibration, acoustics and sonic fatigue.

Combined Environment Verification Branch (VASV): conducts mechanical and thermal testing to support integrated structures R&D.



STRUCTURES CORE AREAS

Structural Sustainment

Applying the latest tools and techniques to keep old aircraft flying while reducing maintenance costs and increasing performance. Modeling and simulation, cost reduction programs, and capability enhancement technology are used to fulfill the warfighter's pressing needs.
Supports Air Vehicle Directorate's sustainment focus area.

Design, develop, demonstrate active flow control for weapons bay noise reduction. Active systems are easier-less costly to design, lighter, adaptive, expand weapons delivery envelope, and enhanced weapon separation
as compared to present passive systems.

Vertical tails on high performance aircraft can experience damaging unsteady airloads (buffet) caused by vortices shedding from the wing/fuselage intersection and impinging on the tails. Piezoelectric actuators are optimally attached to the skin on both surfaces of the starboard tail to cover an area over which the required moment can be applied to counter and effectively damp out the expected vibratory response.

Integrated Structural Design

Changing the design paradigm for air vehicle structures from simply using the structure for reacting airframe loads to designing the structure concurrently with other airframe disciplines for greater system level benefits. This enables lighter and/or less expensive airframes, adaptive configurations, and multi-functional structures. This core area develops these highly integrated structural concepts and design methods that enable the new design paradigm.

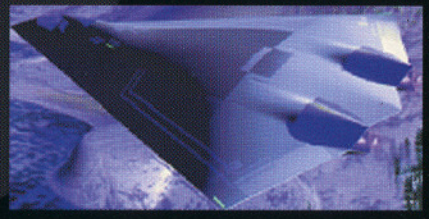
Active Aeroelastic Wing and adaptive structures represent a new wing structural design approach that integrates flight control design to enhance aerodynamic, control, and structural performance. The Composites Affordability Initiative and Robust Composite Sandwich Structures Programs demonstrate design concepts that allow a more unitized approach to aircraft structure, resulting in increased performance and life at reduced cost and weight.

Our Multidisciplinary Technologies Center of Excellence is staffed with experts in design and integration, optimization, aerospace sciences, and computational analysis to to support development of innovative and affordable military aerospace vehicles.

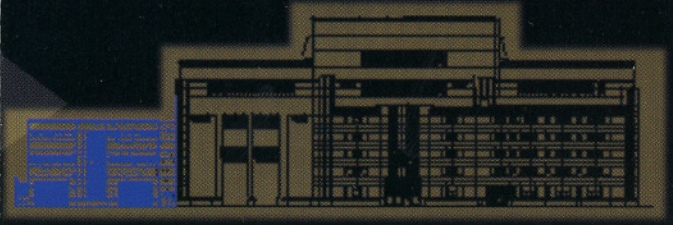
Extreme Environment Structures

Leading Air Vehicles Directorate Migration to Space with Novel Thermal Structure Design and Criteria. This core area is also extending our high speed structure heritage, addressing combined thermal, acoustical, and mechanical load effects. Supports all Air Vehicles Directorate focus areas of sustainment, unmanned air vehicles, and trans-atmospheric vehicles.

Low observable and exhaust washed structures represent challenges for current and future systems durability. We have the capability to develop, fabricate and test a highly survivable, structurally integrated exhaust system.



Test facilities apply extreme thermal and acoustic loads to coupons and representative specimens to determine life and to verify design/analysis.



New construction is underway to allow the simultaneous application of operational thermal, acoustic, and mechanical loads to large articles. The MILCON addition to building 65 will be operational in 2003.